

Radiofrequency Ablation of Hepatic Cysts: Evaluation of Therapeutic Efficacy

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ABSTRACT

Purpose: To evaluate therapeutic efficacy of radiofrequency (RF) ablation for treatment of hepatic cysts with the use of a single cooled electrode after aspiration of the cyst contents.

Materials and Methods: Fourteen hepatic cysts (mean diameter, 7.8 cm; range, 3.7–12.7 cm) in 14 patients treated by RF ablation during a 3-year period were retrospectively reviewed. RF ablation was performed after aspiration of the cyst contents until a cyst measured no more 3 cm in diameter. The volumes of each cyst on computed tomography (CT) were measured before and after RF ablation, and volume reduction rates were calculated.

Results: Follow-up CT was performed a mean of 437 days after RF ablation (range, 32–1,326 d). One cyst was surgically removed because of regrowth. Nine had a volume reduction rate greater than 75%. Eight of nine cysts 8.5 cm in diameter or smaller markedly decreased in volume (mean reduction rate, 93.6%; range, 76.8%–100%). Cysts 8.5–12.0 cm in diameter ($n = 4$) showed a 61.7% reduction rate (range, 26.0%–98.8%). The mean volume reduction rate was 83.5% (range, 8.1%–100%) in the nine cysts with less than 10 mL of residual fluid after aspiration, compared with 43.2% in the five cysts with more than 10 mL of residual fluid. The volume reduction rate was 34.4% in septated cysts after aspiration, in contrast to 83.0% in nonseptated cysts. There were no major complications from RF ablation.

Conclusions: RF ablation may be effective for the treatment of benign hepatic cysts and may be considered as an alternative to conventional sclerotherapy or surgery.

ABBREVIATION

RF = radiofrequency

Most benign hepatic cysts are asymptomatic and require no treatment. However, treatment is necessary when they become large and/or symptomatic. To prevent recurrence, the cyst wall epithelium should be destroyed (1). As a cyst treated with only aspiration can recur, various sclerosing agents have been injected into cysts to reduce the possibility of recurrence (2–8). Although percutaneous ethanol ablation is considered an alternative to surgery or even a first-line treatment of hepatic and renal cysts (9), a 5–7-F drainage catheter may be inserted into a cyst if it is large (10), or repeated

aspiration with the use of alcohol installation may be required (11).

In their experimental study, Song et al (12) reported that radiofrequency (RF) ablation could produce coagulation necrosis of the gallbladder wall. Rhim et al (13) and Du et al (14) treated hepatic cysts with the use of a prong-type electrode, and Du et al (14) used multiple electrodes when treating a cyst larger than 10 cm. As heat destroys the inner lining epithelium of a cyst, RF ablation with the use of a cooled electrode can also successfully treat hepatic cysts. We now report our experience with the use of RF ablation with a cooled electrode for the treatment of hepatic cysts after aspiration of the cystic contents performed to decrease ablation time and to increase its efficacy.

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MATERIALS AND METHODS

Patient Population

Our institutional review board approved this retrospective review of collected patient data. Patients were

included in the study if they underwent ultrasound (US)-guided RF ablation of a hepatic cyst. Patients did not undergo RF ablation if their cyst had a solid component, if there were more than two septae (ie, more than three chambers) seen on computed tomography (CT), if there was communication of the cyst with the bile duct seen on preablation CT, if there was bile-stained aspirated fluid suggestive of a biloma or bile-duct communication, or in the presence of coagulopathy (platelet count $< 50 \times 10^3/\mu\text{L}$ or International Normalized Ratio > 1.5).

A search of our institution's RF ablation database from January 2004 to August 2007 revealed 14 patients (two men and 12 women; mean age, 63 y; age range, 38–76 y) with 14 hepatic cysts (mean diameter, 7.8 cm; range, 3.7–12.7 cm). These patients underwent RF ablation as a result of cyst enlargement ($n = 7$), right upper quadrant discomfort ($n = 4$), or their fear that a cyst may become malignant ($n = 3$). CT was performed within 45 days before RF ablation to verify the status of the cyst. The length, width, and height of each cyst were measured before and after ablation, and the volume reduction ratios were estimated.

On follow-up examinations performed before RF ablation, seven cysts had become very large (mean volume change, 356.7%; range, 192.4%–609.4%) and three cysts had become slightly larger, with 114.0%, 115.5%, and 122.2% increases in volume. A symptomatic cyst was diagnosed when a patient experienced continuous abdominal discomfort or pain at the site of a peripheral hepatic cyst and when tests, including gastroendoscopy, complete blood counts, and blood chemistry, showed negative findings.

Among the 14 study patients, cytologic findings in the aspirated cyst contents were negative in eight, and endoscopic retrograde cholangiography in four did not show communication with the bile duct.

RF Ablation

All procedures were performed under intravenous conscious sedation with 50 μg of fentanyl citrate (BCWorld Pharm, Seoul, Korea) and local anesthesia. During RF ablation, the remaining 50 μg of fentanyl citrate was intravenously injected if a patient reported abdominal pain.

The insertion point on the skin was marked when a safe needle tract was secured on US. Approximately 10 mL of 2% lidocaine (Jeil Pharmaceutical, Daegu, Korea) was injected as local anesthesia, from the hepatic capsule to the insertion point along the needle tract. A single, cooled electrode (Cool-tip RF ablation system; Valleylab, Burlington, Massachusetts) was inserted into the center of a cyst, followed by insertion of a 21-gauge Chiba needle (Cook, Bloomington, Indiana). The cystic content was aspirated through a Chiba needle until the cyst was approximately 3.0–3.5 cm in diameter to reduce its size and the required ablation time (Fig 1). A total of

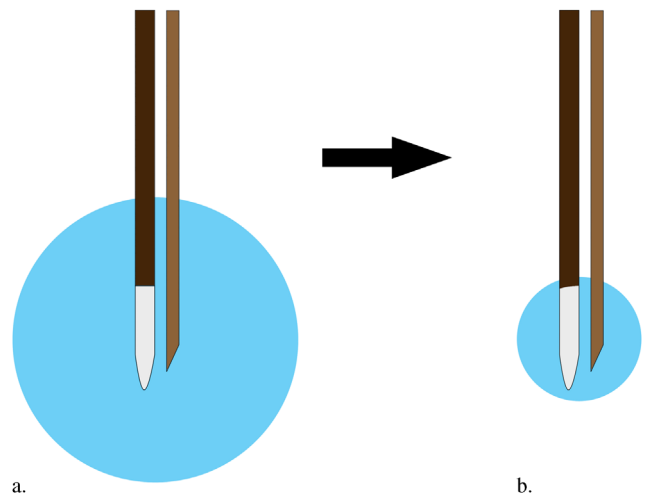


Figure 1. Diagram of cyst content aspiration. (a) A cooled electrode and a Chiba needle were inserted into a cyst. (b) The cyst was decreased to 3 cm of the active tip after aspiration of the cyst content through a Chiba needle. (Available in color online at www.jvir.org.)

10 mL of 2% lidocaine was then injected into the cyst through the Chiba needle 5 minutes before RF ablation for the purpose of inner epithelial anesthesia.

All RF ablation was performed under US guidance by a radiologist (P.N.K.) with 10 years of clinical experience in the field of RF ablation. RF ablation was performed with a 200-W generator (Cool-tip; Valleylab) and a single cooled electrode with a 3-cm active tip. To maximize power and minimize ablation time, a circulating pump was not used during the ablation and chilled saline solution was not circulated through the electrode. Current was maximally increased starting at the beginning of the ablation. When temperature of the electrode reached 85°C, 2 mL of cystic fluid was aspirated through a Chiba needle and then repeatedly injected every 10 seconds through a 5-mL syringe to make the temperature even in the cyst and to deliver homogenous heat to the cyst wall. Thereafter, the power was manually controlled to maintain a temperature higher than 65°C for 3 minutes and to destroy the inner lining of the epithelial cells. The electrode was then removed, and the remaining cystic fluid was aspirated. An iU22 US system (Philips Healthcare, Bothell, Washington) with a 2–5-MHz convex transducer was used for procedural monitoring.

Pre- and Posttreatment Assessment and Follow-up

Although US imaging was obtained in all patients before and after RF ablation, we used only CT to measure cyst volumes. All patients underwent contrast-enhanced abdominal CT with 5-mm slice thickness (LightSpeed Plus or LightSpeed Ultra16 [GE Healthcare, Milwaukee, Wisconsin] or SOMATOM Sensation 16 [Siemens Medical Solutions, Forchheim, Germany]) before and after

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